laws of attraction or repulsion, and with one predominant mass; 10th, the rigorous transition from the theory of binary to that of multiple systems, by means of the disturbing part of the whole characteristic function, and approximate expressions for the perturbations.

A paper was also read, entitled, "Observations on the Motions of Shingle Beaches." By Henry R. Palmer, Esq., F.R.S.

The author states that the object of his inquiries is limited to the collection of such facts as may assist in establishing practical rules for controlling the motions of the beach, with a view, on the one hand, to the preservation of clear channels where such are wanted, and on the other, to the obtaining accumulations of shingles in situations where they may be useful. He considers the actions of the sea on the loose pebbles as of three kinds; the first, which he terms the *accumulative action*, heaps up or accumulates the pebbles against the shore; the second, or the *destructive action*, disturbs and breaks down the accumulations previously made; and the third, or *progressive action*, carries the pebbles forwards in a horizontal direction. The causes of these actions are referable to two kinds of forces; the one being that of the current, or the motion of the general body of the water in the ebbing and flowing of the tides; and the other that of the waves, or that undulating motion given to the water by the action of the winds upon it.

He adduces many facts which show that it is not, as is generally believed, the currents which move the pebbles along the coast, the real agent being the force of the waves, the direction of which is determined principally by that of the prevailing winds, which, on the coasts of Kent and Sussex, where the author's observations were chiefly made, is from the westward. Every breaker drives before it the loose materials which it meets, throwing them up on the inclined plane on which they rest, and in a direction corresponding generally with that of the breaker. In all cases, the finer particles descend the whole distance with the returning breaker, unless accidentally deposited in some interstice; but the larger pebbles return only a part of the distance, this distance having an inverse ratio to its magnitude. This process constitutes the accumulative action. Under other circumstances, on the contrary, depending on the quickness of succession of the breakers, pebbles of every dimension return the whole distance along which they had been carried up, and are also accompanied in their recession by other pebbles, which had been previously deposited; and this constitutes the destructive action. This latter action is also promoted by a form of coast, such as that produced by rocks, tending to confine the returning waves in particular channels, whereby, being collected into streams instead of being broken and dispersed, they acquire, on the recoil, sufficient force to carry down the pubbles, and deposit them below the general surface. The author gives examples of these effects, from what he has observed in the neighbourhood of the harbours of Folkstone, Dover and Sandgate, and along the coast as far as the bay called Sandwich Flats; accompanied by illustrative drawings

On these principles, the author thinks it will readily appear why the various attempts hitherto made to divert the motion of the shingles to a distance from the general line of the shore, both at Dover and at Folkstone, have invariably failed; and he recommends, for the prevention of the evil of accumulation, the adoption of a more general system of management along the coast, in preference to the resorting to particular devices adapted exclusively to each particular case.

The reading of a paper, entitled, "On some Elementary Laws of Electricity." By W. Snow Harris, Esq., F.R.S.—was commenced.

April 17, 1834.

FRANCIS BAILY, Esq., Vice-President, in the Chair.

The reading of Mr. Harris's paper was resumed in continuation.

April 24, 1834.

DAVIES GILBERT, Esq., D.C.L., Vice-President, in the Chair.

The reading of Mr. Harris's paper was concluded.

For the purpose of determining several questions relative to the forces exerted by bodies in different states of electricity, the author contrived an electroscope of peculiar construction, and also an electrometer, both of which he minutely describes; and in order to obtain a unit of measure, in estimating the quantity of electrical accumulation, instead of transmitting the electricity evolved by the machine immediately from its conductor to the battery to be charged, he interposes between them a coated jar, furnished with a discharging electrometer, so that the quantity of charges that have passed through it may be estimated by the number of explosions occurring in the process of accumulation. By increasing or diminishing the distance between the discharging balls, the value of the unit may at pleasure be rendered great or small.

A series of experiments is described, showing that when a given quantity of electricity is divided among any number of perfectly similar conductors, the attractive force, as measured by the electrometer, is inversely as the square of that number; and if different quantities of electricity be communicated to the same conductor, their attractive forces are directly as the squares of those quantities.

The author observes that the electrical force exerted by one body on another is always diminished by the vicinity of a neutral body; an effect which is analogous to the operation of screens in diminishing the force of a revolving magnet on metallic disks, as noticed by him in a former paper, published in the Philosophical Transactions. It appears, thus, that there is, in all these cases, a portion of electricity, which is masked, and not appreciable by the electrometer.